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Proceedings of the Regional Peer Review of the Assessment of Greenland Halibut in the Gulf of St. Lawrence (4RST)

March 13, 2018
Mont-Joli, QC

Chairperson: Denis Chabot
Rapporteur: Sonia Dubé

Maurice Lamontagne Institute
Fisheries and Oceans Canada
850 Route de la Mer, P.O. Box 1000
Mont-Joli, Quebec G5H 3Z4

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Foreword

The purpose of these proceedings is to document the key activities and discussions of the meeting. The proceedings may include research recommendations, uncertainties and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. Therefore, interpretations and opinions presented in this report may be factually incorrect or misleading, but are included to record, as faithfully as possible, what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in changes to the conclusions, particularly if additional information was identified as relevant to the topics being considered, but not available at the time of the meeting. In the rare case when there are formal dissenting views, these are also archived as appendices to the proceedings.

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SUMMARY

This document contains the proceeding from the meeting held within the regional Assessment of Greenland Halibut in the Gulf of St. Lawrence (4RST). This review process was held on March 13th, 2018 at the Maurice Lamontagne Institute in Mont-Joli. This meeting gathered more than forty participants from sciences, management and industry. This proceeding contains the essential parts of the presentations and discussions held and relates the recommendations and conclusions that were presented during the review.

INTRODUCTION

The Quebec Region of Fisheries and Oceans Canada (DFO) is responsible for assessing several stocks of fish and invertebrate species harvested in the Estuary and Gulf of St. Lawrence. Most of these stocks are periodically assessed as part of a regional advisory process conducted at the Maurice Lamontagne Institute in Mont-Joli. This document consists of the proceedings of the assessment meeting held on March 13, 2018, on the assessment of the Gulf of St. Lawrence Greenland Halibut stock (4RST).

The objective of the review was to determine whether there were any changes in the resource's status and whether adjustments were required to the management plans based on the chosen conservation approach, the ultimate goal being to provide scientific advice on managing the Gulf of St. Lawrence Greenland Halibut stock (4RST) for the 2018-2019 fishing season.

These proceedings report on the main points discussed in the presentations and deliberations stemming from the activities of the stock assessment regional committee. The regional review is a process open to all participants who are able to provide a critical outlook on the status of the assessed resources. Accordingly, participants from outside DFO are invited to take part in the committee's activities within the defined terms of reference for this review (Appendices 1 and 2). The proceedings also list the recommendations made by meeting participants.

CONTEXT

Meeting chairperson Denis Chabot welcomes participants. He goes over the peer review objectives and agenda. After the participants introduce themselves, Stock Assessment Biologist Johanne Gauthier begins the meeting by highlighting the contribution of her collaborators. She begins by justifying the reasons for this review during an interim year. Stock status monitoring indicators were updated in December 2017 and showed significant decreases in DFO research survey indicators and in commercial fishery landings. According to the analysis of the biomass indicator for fish over 40 cm last year, the trigger threshold was reached, and a stock reassessment was warranted. The science advisory report prepared following this meeting will discuss perspectives for the May 15, 2018, to May 14, 2019, fishing season. The next assessment is scheduled for winter 2019.

Ms. Gauthier presents the agenda and the framework for the review. Some points regarding turbot biology are described. The Gulf population is considered an isolated Northwest Atlantic stock. Ecosystem models highlight the trophic relationships (predator-prey) of the small and large turbot. Turbot abundance trends from 1990 to 2017 were comparable to northern shrimp abundance trends. The arrival of three very strong cohorts of redfish from 2011 to 2013 increased interspecies competition for the Greenland halibut, which occupies a similar ecological niche. The Gulf of St. Lawrence ecosystem has undergone significant changes in recent decades. Its deep waters are warming up, and the oxygen there is being depleted. These factors may have resulted in a loss of habitat and lower growth rates for the Greenland halibut. Deep-water temperatures will remain high in the coming years.

Léopold Ghinter briefly presents the preliminary results of the work dealing with the impact of temperature on turbot juvenile growth, sex and sexual maturity of the turbot, as well as the origin of juveniles. A few questions were raised, namely:

- What is the potential link between temperature and the observed decrease in size at sexual maturity? Is this a combined effect?

- What effect does diurnal vertical migration have on juvenile growth, given that turbot migrate in the water column to feed? This variable was not taken into account in the study, however.
- It is possible that males migrate towards other locations earlier because they mature earlier, resulting in a mainly female turbot presence in nursery sites.

RESOURCE ASSESSMENT

FISHERY

Ms. Gauthier presents an overview of the Greenland halibut fishery in 4RST, which includes 96 active permits in Quebec and 61 in Newfoundland. This fishery is dominated by fixed gear; 99% of catches are from the gillnet fishery. Commercial fishery statistics and biological data from the commercial catch sampling program are presented.

For the 2017–2018 fishing season, Greenland halibut landings reached 1,665 t (preliminary numbers as at December 31) with a fishing allocation of 3,750 t (TAC = 4,500 t). These landings are much lower than the average over the past 10 years for the same period (3,358 t). Throughout the Gulf, the directed gillnet fishing effort for Greenland halibut has been in decline since 2013 and under the series average since 2015. This decrease is the result of the abandonment of the northern Anticosti area in addition to decreased efforts in the Esquiman area. The fishing effort has remained stable in the western Gulf since 2015 and accounted for more than 80% of the total fishing effort in 2017.

Between 2016 and 2017, the commercial fishery performance indicator (catch per unit effort, or CPUE) for the entire Gulf fell by 36% and was below the 1999–2016 series average. Of these three areas, the western Gulf has had the biggest indicator drop with a decrease of more than 50% compared to historic highs in 2015 and 2016. In the north of Anticosti and Esquiman areas, the indicator has been falling since 2009 and been below the average of each series since 2013.

- It is suggested that the evolution of the fishing effort over the season be presented.
- According to industry representatives, the drop in the performance indicator (CPUE) is related to the low fishing effort and not to the resource's availability. However, a drop in landings has also been noted for a similar effort.
- In the directed gillnet fishery, bycatch numbers estimated according to data from at-sea observers represent, on average, 50% of the weight of Greenland halibut catches. About one-third of these bycatches was landed. Industry representatives have strong reservations about the observer data. It seems that this data does not reflect reality. There is, of course, uncertainty surrounding this estimate, but remember that this ratio is affected by the significant decrease in turbot catches.
- It is thought that redfish should be more strongly represented in turbot fishery bycatches as a result of its larger size.

DFO AND SENTINEL SURVEYS

Ms. Gauthier reviews data from the DFO scientific survey and the scientific mobile gear sentinel fisheries (MSF) survey. In 2017, biomass indicators for fish over 40 cm in DFO and MSF surveys fell by 44% and 30%, respectively, compared to 2016 and were below their respective series average. These indicators have shown a general downward trend for more than 10 years. The strong 2012 and 2013 cohorts have grown more slowly than the average, and their recruitment to the fishery is uncertain. Abundance was average for the 2014 cohort, and weak

for the 2015 and 2016 cohorts. Fish of the 2012 to 2015 cohorts have below-average condition indices. The condition index for the 2016 cohort at 1 year is above average..

- Industry representatives express reservations about the drop in biomass indicators in the surveys. They wonder about vertical migration being taken into account and about survey coverage. It should nevertheless be remembered that this is a relative, comparable (year-to-year) indicator with good coverage of the Greenland halibut's distribution area.
- The plan is to extend the series for the 1984–1989 series based on data from the DFO survey that was conducted using the *Lady Hammond*.
- It is interesting to note the similar trajectory between abundance indicators for the Greenland halibut from the DFO survey in the northern Gulf of St. Lawrence and from the DFO survey in the southern Gulf of St. Lawrence.
- It is mentioned that the size at which the species reaches sexual maturity (visual evaluation) is uncertain. It is suggested to do a histological study to determine sexual maturity

EXPLOITATION RATE

The relative exploitation rate (estimated ratio between landings and fish biomass > 40 cm based on the DFO survey) is presented by fishing area and for the entire Gulf (4RST). Throughout the Gulf, the 2017 exploitation rate indicator was near the series average despite lower landings. This indicator is on the rise, however, in the western Gulf.

- The lack of consistency between the assessment year (calendar year) and the management year (spanning two years) is noted.

SCALE MODEL

Progress on the work to improve the statistical catch at length (SCALE) model is briefly presented as a tool for assessing the Greenland halibut population in the Gulf of St. Lawrence moving forward.

PRECAUTIONARY APPROACH

Ms. Gauthier briefly describes the precautionary approach. The longest possible time series is used to determine the points of reference, that is, the biomass indicator for fish longer than 40 cm from the 1990–2017 DFO series. The limit reference point (LRP) has already been established and corresponds to B_{rec}, i.e., to the lowest population observed in the past, followed by a recovery. As for the upper stock reference point (USR), the Science Sector proposed using 80% of the B_{msy}. According to this USR, the Gulf of St. Lawrence Greenland halibut stock has been in the cautious zone for two years.

- Industry representatives consider that no further information is available from previous years to help determine the USR. The Science Sector, however, considers that this proposal is very late coming. It is important to see it now.
- After discussion, the Science Sector proposes using 80% of the B_{msy} as the USR. This proposition could be studied by a committee consisting of management, industry and Science representatives.
- As for the LRP, it was decided not to reopen the debate, even though some think that the ecosystem status has changed, which could challenge the relevance of the B_{rec}. That said, it is considered that it is better to move forward, which in no way prevents noting down the concerns raised. It is added that decision-making rules would help streamline everything.

- It is deemed appropriate to base reference points on an empirical approach, which is also commonplace.

CONCLUSION

RESEARCH

Research projects underway at the MLI:

- Integrated management tools for sustainable exploitation of Greenland Halibut throughout Eastern Canada, NSERC-Strategic, 2015-2018, Louis Bernatchez (Université Laval), Céline Audet, Réjean Tremblay (ISMER), Pascal Sirois (UQAC) and Yvan Lambert (DFO).
- Trophic interactions (predators and prey) and the main causes of mortality associated with Greenland Halibut in the Estuary and northern Gulf of St. Lawrence (2011-2014), 2015-2017, Claude Savenkoff, Hugo Bourdages, Denis Chabot (DFO, MLI).
- Effect of ocean acidification and temperature on Greenland halibut physiology and tolerance to hypoxia, SPERA and ACCASP 2018 - Denis Chabot

Future research projects at the MLI:

- Determining turbot length at sexual maturity through histology studies;
- Continuing to develop dynamic population models;
- Developing the precautionary approach.

HIGHLIGHTS AND RECOMMENDATIONS

The highlights are presented and the participants comment on them. Some facts are withdrawn; others are simplified. Comments having to do with stylistic rewording are not reported.

- In terms of the landing highlight, TAC should be referenced in addition to allocation. It is important to compare similar time periods and to specify whether the management year or calendar year is being used.
- In highlights on catch distribution; it is suggested that the perspective before 2014 be given. It is important to note that the fishing effort has been focused in the western Gulf.
- As for the fishery performance indicator, in general, it is better to describe the evolution of CPUE for each area (western Gulf, northern Anticosti, Esquiman). It should be pointed out that these values are the lowest observed in many years.
- As for biomass indicators from DFO and MSF surveys, the only observation worth maintaining is the fact on fish over 40 cm, in addition to the downward trend observed for over a decade.
- As for the point concerning the strong 2012 and 2013 cohorts, it is agreed to state that these cohorts grew more slowly than normally, and that as a result recruitment to the fishery is uncertain.
- In the highlight on the condition index, it will simply be said that condition indices for fish from the 2012–2015 cohorts are below average, and that the condition index for the 2016 cohort at 1 year is above average.
- In the highlights on ecosystem changes, no reference will be made to 2017 and to the thermal limit observed for the turbot.

- As for highlights on the exploitation rate, simply say that it was close to the average in 2017.
- As for the fact on short-term perspectives, using the term concerning rather than uncertain would be preferred. Related factors to be mentioned include ecosystem changes, low recruitment, decreases in abundance and biomass indicators for fish over 40 cm, and the fishery's lower performance indicator.
- As for the highlight on the reference points, it is agreed to indicate what the Science Sector proposed (i.e., 80% of the B_{msy}, without specifying the value) and to indicate which zone the stock is located based on that proposition (cautious zone). It was insisted that it be indicated that this is only a proposal.
- Following discussion, the way to formulate the recommendation was agreed upon.

The participants' final recommendation is as follows:

The short-term outlook for the Greenland Halibut stock in the Gulf of St. Lawrence is concerning given ecosystem changes, poor recruitment, decreasing indices of abundance and biomass of fish over 40 cm, and the reduction in the fishery performance index. As a result, withdrawals should be reduced for the 2018-19 fishing season to avoid an increase in the exploitation rate.

APPENDIX 1 – LIST OF PARTICIPANTS

Name	Affiliation
Belley, Rénald	DFO Science
Benoît, Hugues	DFO Science
Bernier, Denis	DFO Science
Boucher Jean-René	RPPNG
Bourdages, Hugo	DFO Science
Brassard, Claude	DFO Science
Castonguay, Martin	DFO Science
Cerqueira, Andy	MAPAQ
Corriveau, Julie	DFO Science
Côté, Jean-François	Industry
Chabot, Denis	DFO Science
Chouinard, Pierre-Marc S.	DFO Science
Coffin, David	DFO Fisheries management
Cyr, Charley	DFO Science
Denis, Marcel	ACPG
Desgagnés, Mathieu	DFO Science
Dubé, Pierre	Industry
Dubé, Sonia	DFO Science
Duplisea, Daniel	DFO Science
Dwyer, Shelley	Government of Newfoundland and Labrador
Cervello, Gauthier	UQAR-ISMER
Gauthier, Johanne	DFO Science
Ghinter, Léopold	UQAR-ISMER
Gilbert, Michel	DFO Science
Hardy, Magalie	DFO Fisheries management
Hurtubise, Sylvain	DFO Science
Lambert, Yvan	DFO Science
Langelier, Serge	AMIK
Lubar, John	DFO Fisheries management
Marquis, Marie-Claude	DFO Science
Morin, Bernard	DFO Fisheries management
Morneau, Renée	DFO Science
Ouellette-Plante, Jordan	DFO Science
Plourde, Stéphane	DFO Science
Poirier, Mélanie	DFO Science
Robert, Dominique	UQAR
Roux, Marie-Julie	DFO Science
Sainte-Marie, Bernard	DFO Science
Sandt-Duguay, Emmanuel	AGHAMM
Savenkoff, Claude	DFO Science
Senay, Caroline	DFO Science
Vallée, Daniel	RPPNG

APPENDIX 2 – TERMS OF REFERENCE

Assessment of the Gulf of St. Lawrence (4RST) Greenland Halibut

Regional Peer Review – Quebec Region

March 13, 2018
Mont-Joli, QC

Chairperson: Denis Chabot

Background

An update of the stock status indicators for Greenland halibut (*Reinhardtius hippoglossoides*) in the Gulf of St. Lawrence (NAFO divisions 4RST) was conducted in December 2017 (DFO 2018). This update revealed significant decreases in DFO survey indices and commercial landings. The analysis of the biomass index of fish larger than 40 cm in the last year showed that the trigger point had been crossed and that a re-evaluation of the stock was justified.

It is in this context that DFO Fisheries Management requested a complete assessment of the Greenland halibut stock for the winter of 2018. This re-evaluation could result in a revision of the catch recommendations for the fishery.

Objectives

Provide scientific advice on Greenland halibut stock status in NAFO Divisions 4RST. This advice shall include:

- Description of the biology of Greenland halibut and its distribution;
- A summary of oceanographic conditions in the Gulf;
- Analysis of the commercial fishing data including landings, fishing effort, catch per unit effort, biological data and Greenland halibut by-catches in other fisheries;
- Analysis of data from the DFO annual research trawl survey and mobile sentinel fisheries;
- Analysis of fishing effort distribution according to Greenland halibut abundance distribution;
- Analysis of the Statistical Catch at Length (SCALE) model as a potential tool for assessing the Greenland halibut population;
- Proposal of the upper reference point consistent with the precautionary approach;
- Perspectives for 2018 based on available indicators;
- Identification and priorization of research projects to be considered for the future.

Expected publications

- Science Advisory Report on the Greenland Halibut in the Gulf of St. Lawrence (4RST)
- Research document
- Proceedings containing a summary of discussions

Participation

- Fisheries and Oceans Canada (DFO) (Science and Fisheries Management sectors)
- Fishing industry
- Provincial representatives
- Aboriginal communities / organizations